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April 12, 1991

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VIA HAND DELIVERY

Mr. Jon K. Bornholm
Remedial Project Manager
United States Environmental
Protection Agency, Region IV
345 Courtland Street, N.E.
Atlanta, Georgia 30365

Re: Medley Farm Site

Dear Mr. Bornholm:

I am writing on behalf of the Medley Farm Site Steering Committee. In accordance with the National Contingency Plan, the Steering Committee hereby submits comments on the Environmental Protection Agency's ("EPA") proposed plan for remedial action at the Medley Farm Site ("the Proposed Plan").

The Proposed Plan calls for:

°recovery and treatment of groundwater that exceeds maximum contaminant levels at the Site; and

°soil vapor extraction to remove residual source contamination.

EPA has concluded that the low levels of contamination remaining in the soils at the Site pose no significant risk to human health and the environment. Nonetheless EPA has proposed that the soils be remediated through soil vapor extraction (SVE) to speed and enhance the groundwater remediation at the Site. The Steering Committee and its consultant, Sirrine Environmental Consultants, do not agree that soil remediation should be required in addition to direct groundwater remediation.

Almost all soil contamination was removed in the emergency removal action in 1983. The residual soil contamination remaining at the Site will naturally flush through and be captured by the

groundwater recovery and treatment system with no significant impact on the operational life of that system. Groundwater remediation alone will result in a permanent reduction of Site contaminants. The proposed soil vapor extraction remedy would, therefore, add to the cost of remediation at the Site without appreciably reducing the potential risks posed by the Site or the length of time for full remediation to eliminate those potential risks.

The Steering Committee believes that soil vapor extraction should be eliminated from the plan for remedial action. We propose that EPA instead select natural flushing combined with groundwater recovery and treatment as the remedy for the Site. The effectiveness of this remedy will be reviewed after five years of implementation. The impact of natural flushing on the groundwater remediation can be evaluated more effectively at that time. At this point, the estimated impact is not significant enough to require a source control remedy such as soil vapor extraction.

The Steering Committee's position and alternative proposal are discussed more fully in the attached comments. The Steering Committee and Sirrine are available to answer any questions you might have.

Sincerely,

Mary Jane Norville

Mary Jane Norville

MJN:lwb
Attachment
cc: Elaine Levine (w/attachment)
Keith Lindler (w/attachment)
Jim Cloonan (w/attachment)
Jim Chamness (w/attachment)
Medley Farm Site Steering Committee (w/attachment)

# COMMENTS ON PROPOSED PLAN FOR REMEDIAL ACTION AT THE MEDLEY FARM SITE

APRIL 12, 1991

SUBMITTED

BY

THE MEDLEY FARM SITE STEERING COMMITTEE

BACKGROUND

The U.S. Environmental Protection Agency (EPA) released a proposed plan for remediation of the Medley Farm Site ("Site") in Gaffney, South Carolina on February 7, 1991. The preferred remedy involves:

Treatment Using Air Stripping: Recovery of all ground water above maximum contaminant levels ("MCLs") and treating the extracted ground water prior to discharging to Jones Creek through an air stripping tower (Alternative GWC-2A); and

Soil Vapor Extraction: Soil vapor extraction in areas exceeding calculated soil remediation levels. If necessary to comply with applicable portions of the Clean Air Act and the South Carolina Pollution Control Act, the extracted vapors will be controlled using an activated carbon unit (Alternative SC-3).

The Medley Farm Site Steering Committee ("the Steering Committee") represents the parties who agreed under an Administrative Order by Consent to perform the Remedial Investigation/Feasibility Study ("RI/FS") for the Site. Sirrine Environmental Consultants ("Sirrine") served as the Steering Committee's consultant for performance of the RI/FS. The Steering Committee and Sirrine have reviewed the proposed plan. The Steering Committee hereby submits comments on the plan and requests consideration of changes in the plan based on these comments.

Specifically, the Steering Committee and Sirrine believe that active remediation of Site soils is not necessary or cost-effective. The rationale for their disagreement with the proposed plan and a proposed alternative are set forth below.

OBJECTION TO REMEDY: NECESSITY OF SOURCE CONTROL

The great majority of chemical residuals at the Site were removed during the immediate removal action in 1983. Remaining contaminants in soils consist of low levels (generally less than 1 mg/kg) of primarily volatile organic compounds (VOCs). The baseline risk assessment determined that Site soils do not pose a significant risk to human health or the environment through a direct pathway.

The only risk posed by Site soils is the indirect risk that occurs through the leaching of VOCs from certain areas of soils into groundwater. As rainwater infiltrates the soils, the VOCs are naturally flushed in the groundwater (Alternative SC-1). VOCs in groundwater can then be recovered using extraction wells and treated (Alternative GWC-2A). Consequently, when the groundwater extraction system is operational, site soils will no longer pose a risk to potential receptors either directly or indirectly.

Remediation of Site soils is not necessary to protect human health or the environment from direct or indirect risks. All Site soils are less than the TSCA remediation level of 10 mg/kg for PCBs, the

only identified ARAR for Site soils. Therefore, remediation of Site soils is not necessary for compliance with ARARs. Natural flushing (Alternative SC-1) satisfies the threshold criteria given by the National Contingency Plan ("NCP") for Protection of Human Health and the Environment and Compliance with ARARs. Natural flushing is therefore a protective alternative that is eligible for selection as a source control remedy.

Once the threshold criteria are satisfied, selection of a source control remedy must be determined from among the NCP's primary balancing criteria. Although the removal of VOCs from Site soils might be accelerated through soil vapor extraction (SVE; Alternative SC-3), the efficacy of SVE depends on whether it would decrease the time required for overall (soils and groundwater) Site remediation and therefore be cost effective as compared to pump-and-treat alone (i.e., natural flushing).

The primary balancing criteria are:

- long-term effectiveness and permanence
- reduction of toxicity, mobility and volume
- short-term effectiveness
- implementability
- cost

Evaluation of source control measures must be considered in the context of the overall Site remedy, including groundwater extraction and treatment. In this perspective, natural flushing

rates favorably within the balancing criteria. Natural flushing would effect a permanent reduction in the volume of VOCs in soils. These VOCs would then be recovered by the groundwater extraction system and treated, resulting in a net reduction in the toxicity and volume of Site VOCs. Natural flushing can be readily implemented and would pose no risks to the community or the environment during implementation. As discussed below, natural flushing is more cost effective than soil vapor extraction (Alternative SC-3). Alternative SC-1 therefore achieves the best aggregate agreement with the primary balancing criteria from among the source control alternatives.

ESTIMATED DURATION OF GROUNDWATER EXTRACTION: CASE HISTORIES

Given that soils do not pose a significant risk at the Site, the only reason for source control is if it would accelerate the overall remediation of the Site. The Committee and Sirrine do not believe that a source measure, such as SVE, will effect a significant reduction in the time required to achieve remediation levels in groundwater.

A number of recent EPA publications describing actual groundwater remediation experiences indicate that remediation levels would not be achieved long after theoretical models had predicted site restoration. A sampling of EPA documents describing the protracted periods for groundwater remediation include:

- U.S. EPA Evaluation of Groundwater Extraction Remedies. Office of Solid Waste and Emergency Response; EPA/504/0289/054; Washington, DC, 1989.
- U.S. EPA. 1989. Consideration in Ground Water Remediation at Superfund Sites. Memorandum from Jonathan Cannon to EPA Regional Offices, Directive No. 9355-4-03, Office of Solid Waste and Emergency Response 1989.
- U.S. EPA. 1990. Evaluation of Ground Water Extraction Remedies, v. 2, Case Studies, EPA/540/2-89/054.
- U.S. EPA. 1989. Ground Water Issue, Performance Evaluation of Pump-and-treat Remediations. Office of Research and Development.
- Hall, C.W., "Limiting Factors in Ground Water Remediation", 20th Annual Conference on Environmental Law, March 1991, Keystone, Co. [NOTE: C.W. Hall is Director of EPA's Robert S. Kerr Environmental Research Laboratory.]

A review of EPA and other technical publications on groundwater remediation has concluded that restoration to MCLs is "currently unachievable" (Travis and Doty, 1990). The review determined that not "a single aquifer in the United States has been confirmed to be successfully restored through pumping and treating." A separate review article co-authored by EPA personnel (Haley, et al, 1991) identified the following impediments to achieving MCLs in relatively short time frames:

- sorption of contaminants to saturated soils
- aquifer properties, such as subsurface heterogeneity and fractures
- exceedingly low remediation levels
- presence of "stagnation zones" within the groundwater extraction system.

All of these conditions are applicable to the Site. VOCs at the Site have significant organic carbon/water partitioning coefficients, indicating a tendency to sorb to soils. The geology consists of a low conductivity saprolite, a higher conductivity transition zone, and fractured bedrock. Experience at other sites indicates that this heterogeneity will likely protract the time required for aquifer restoration due to differing contaminant desportion rates and discontinuities in hydraulic flow patterns. The collective effect of these factors is to all but guarantee that groundwater remediation at the Site may not achieve MCLs for decades since MCLs at the Site are generally at the low parts per billion range. While groundwater recovery and treatment will reduce contaminant levels significantly (90+%), MCLs will likely not be achieved in predictable time frames with or without source control.

Both review articles (Travis and Doty; Haley, et. al.) indicated that:

- plume containment and mass reduction should be primary objectives of groundwater remediation and

- that restoration of a heterogeneous aquifer to MCLs is not likely.

Numerous EPA documents based on a variety of case histories confirm the technical realization that groundwater remediation is apt to be a containment action that prevents migration. Since MCLs are not likely to be achieved with or without source control in a predictable period of time, and since soils without treatment present no direct risks to human health, the Steering Committee questions the need for active source control measures at the Site. Existing volatile organic compound (VOC) levels in groundwater are evidence that natural flushing is occurring. Contaminants will, therefore, be recovered and treated by the groundwater remediation system. The proposed groundwater remediation system, with or without source control, will reduce contaminant levels significantly. In addition, contaminants will also be contained from migrating beyond Site boundaries and prevent any future risks to potential downgradient receptors. A source control remedy is therefore not required for the remediation of Site soils.

OBJECTION TO REMEDY: COST-EFFECTIVENESS

The cost-effectiveness of SVE can best be evaluated by comparing its present worth costs with the additional groundwater remediation costs associated with natural flushing. Unsaturated transport modeling can be used to predict the time required for natural flushing to remediate Site soils. A batch flushing model can be used to estimate the groundwater remediation period

following SVE and natural flushing. The difference in remediation periods represents the additional groundwater remediation costs that SVE must be compared against.

Existing Groundwater: A batch flushing model (EPA, 1988) was used to estimate the time required to achieve MCLs under current groundwater conditions. Based on a 99.8 percent reduction of total VOCs in groundwater, remediation of Site groundwater is projected to take approximately 10 years assuming no flushing of additional contaminants into the groundwater. This time estimate is almost certainly low, as evidenced by the previous discussion regarding case histories and Site characteristics. A protracted groundwater extraction period would reduce any time and cost savings associated with SVE.

Soil Vapor Extraction: Remediation of Site soils to the remediation levels given in the FS (Table 4.3) would require approximately one year. SVE would be conducted concurrently with groundwater extraction.

Natural Flushing: Based on maximum site concentrations, adsorption to soils, and MCL value, trichlorethene (TCE) would determine the duration of natural flushing. The leaching potential of TCE can be estimated using the unsaturated transport model presented in the FS (Appendix E). Based on maximum soil concentrations at the Site, TCE is projected to impact groundwater above MCLs for approximately 20 years (see attached table).

Therefore, the time estimate projected for groundwater remediation assuming natural flushing with no SVE would be approximately 20 years.

Final Groundwater Extraction with Natural Flushing: Groundwater extraction would be required following completion of natural flushing to remove residual levels of VOCs. VOC levels after 20 years would be approximately at MCL levels (attached table), considerably lower than for current conditions. It is assumed that a 50 percent reduction in VOCs would be required following the completion of natural flushing to obtain MCLs. Using the batch flushing model, the additional groundwater extraction to achieve the 50 percent reduction would require approximately one year.

Final Groundwater Extraction with SVE: SVE is estimated to be completed within one year. Groundwater remediation under current conditions assuming no flushing of additional contaminants into groundwater has been estimated to take 10 years. VOC levels remaining after SVE could not impact groundwater above MCLs. No further groundwater extraction past 10 years would be anticipated if the remediation is accomplished as predicted by the batch-flushing model. Based on the lingering effects of residual VOC levels in groundwater, the extraction period of 10 years is likely an underestimate.

Summary: Natural flushing is projected to result in approximately 11 more years of groundwater extraction than if SVE were conducted. Since the model predicts that a minimum of 10 years of groundwater extraction would be required to achieve MCLs based on current groundwater conditions, the costs for additional groundwater extraction required to address further leaching would not begin until year 10. Experience with groundwater remediation at Superfund sites indicates that groundwater extraction and treatment under current conditions will not likely achieve MCLs within the 10 years projected by the model. The difference in groundwater extraction periods between SVE and natural flushing is therefore likely to be an overestimate.

COST EVALUATION

The total present worth costs (PWC) for SVE (Alternative SC-3) and annual groundwater remediation (Alternative GWC-2A) were estimated in the FS to be:

- SVE: $620,000
- Annual groundwater remediation costs: $81,000

The present worth costs for SVE must be compared with the present worth costs for the annualized series of groundwater remediation costs for the additional 11 years of operation. Calculation of the present worth costs for the additional groundwater remediation is a two step process:

- Convert the annual series to one cost at year 10.

° Convert the cost at year 10 to a present worth basis (year 0).

Present worth costs are evaluated at a discount rate of 5 percent, per EPA guidance. The calculation for the additional 11 years of groundwater remediation is:

P/F

Groundwater remediation PWC = \$81,000 (P/A, 11, 5%)(PF, 10, 5%)
= \$81,000 (8.306)(0.6139)

= \$410,000

COST EFFECTIVENESS DETERMINATION

The present worth costs for soil vapor extraction would be approximately \$620,000. The present worth costs to conduct an additional 11 years of groundwater remediation 10 years in the future, as required for natural flushing, would be approximately \$410,000. Natural flushing (Alternative SC-1) is therefore a more cost effective source control remedy for the Medley Farm Site than soil vapor extraction (Alternative SC-3). The estimated difference in present worth costs of approximately \$210,000 is almost certainly low since groundwater extraction at the Site will likely require more than the estimated 10 years to achieve MCLs with SVE.

Modeling predicts that aquifer restoration would require approximately 21 years through natural flushing and groundwater extraction. Both Site soils and groundwater would be at remediation levels at this time, thereby satisfying SARA's preference for a permanent remedy. The estimate of 10 years for aquifer restoration through SVE and groundwater extraction is

likely optimistic in light of EPA's evaluation of other groundwater remediation projects. The net result is that the apparent difference of 11 years for aquifer restoration through SVE is almost certainly overestimated and the difference in remedial time frames will be less. Any reduction in the differential time for remediation would increase the cost-effectiveness of natural flushing (Alternative SC-1).

OBJECTION TO REMEDY: CONCLUSIONS

- Direct remediation of Site soils (source control) is not required because site soils do not pose a significant risk to human health or the environment.

- The evaluation of groundwater remediation projects by EPA and independent authorities indicates that projections of aquifer restoration periods are greatly underestimated.

- Site conditions are consistent with aquifer and contaminant characteristics that are likely to prolong aquifer restoration.

- Natural flushing (Alternative SC-1) has estimated present worth costs that are approximately $210,000 less than for SVE (Alternative SC-3). Because groundwater models tend to underestimate the time for aquifer restoration, the difference in costs is likely to be significantly higher.

- Active source control is not warranted for the Site based on risk, technical, or cost considerations.

- Groundwater extraction alone can prevent potential future risks, is technically justifiable based on EPA experience, and in conjunction with natural flushing is the most cost-effective remedy for the Site.

PROPOSED ALTERNATIVE

Knowledge of contaminant transport at the Site is based on two sampling events conducted under passive conditions (no remediation) and overly optimistic groundwater models. The Steering Committee proposes that a remedy involving natural flushing (Alternative SC-1) and groundwater control (Alternative GWC-2A) be initiated at the Site. The effects of leaching from soils and groundwater extraction can be evaluated at the 5-year review of remedy using results from regular monitoring events. Projections of the impact of soils on groundwater quality and aquifer restoration time frames can be conducted more effectively at that time. Should the results indicate a significant impact from soils and potential for achieving MCLs in groundwater, a pilot-test for SVE could be conducted to assess its site-specific effectiveness. Full-scale SVE could be implemented once the effectiveness was demonstrated and design parameters were established. This approach would be based on site-specific data and would allow the most demonstrated approach for selection of remedy. Since Site contaminants have been flushing into

groundwater for approximately 18 years, a review period of five years should have no appreciable effect on Site conditions (any variations in groundwater quality would be controlled by the extraction system). The absence of any risks to human health further validates the appropriateness of this approach.

REFERENCES

EPA, Guidance on Remedial Actions for Groundwater at Superfund Sites, EPA/540/G-88/003, Washington, DC, December 1988.

EPA, "Evaluation of Groundwater Extraction Remedies", EPA/504/0289/054, Washington, DC, 1989.

Haley, J.L. et al, "Evaluating the Effectiveness of Ground Water Extraction Systems", Ground Water Monitoring Review, Winter 1991, pp. 119-124.

Travis, C.C. and C.B. Doty, "Can Contaminated Aquifers at Superfund Sites Be Remediates?", Environmental Science and Technology, Vol., 24, No. 10, 1990, pp. 1464-1466.